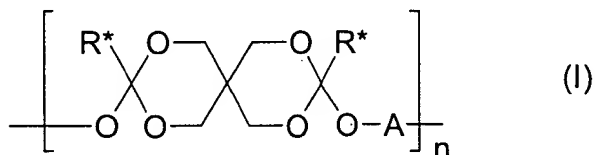


WHAT IS CLAIMED IS:

1. A polyorthoester of formula I:



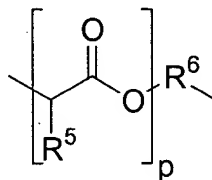
where:

5 R* is a C₁₋₄ alkyl;

n is an integer of at least 5; and

A is R¹, R², R³, or R⁴, where

R¹ is:

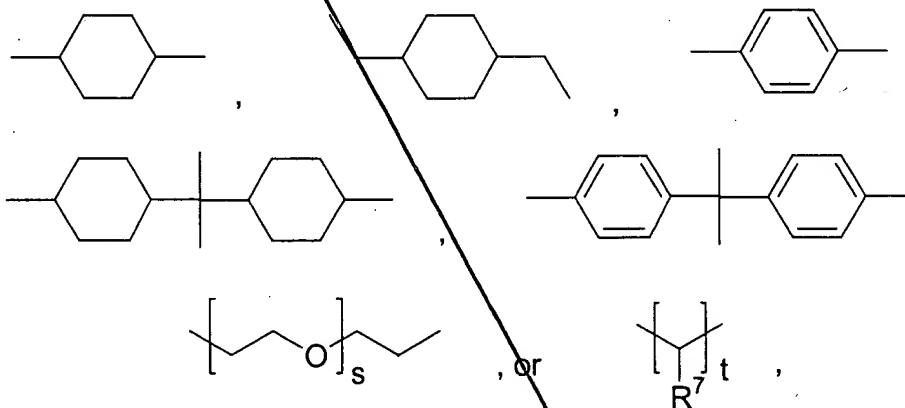


10 where:

p is an integer of 1 to 20;

R⁵ is hydrogen or C₁₋₄ alkyl; and

R⁶ is:



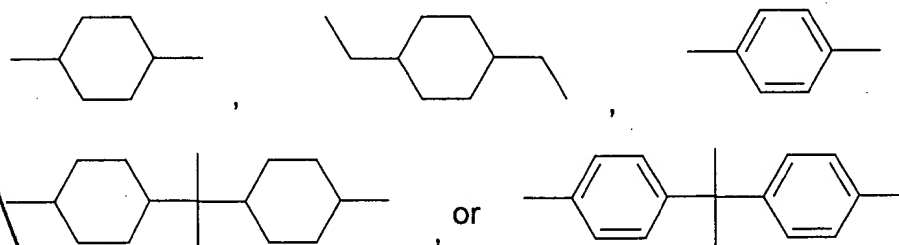
15 where:

s is an integer of 0 to 30;

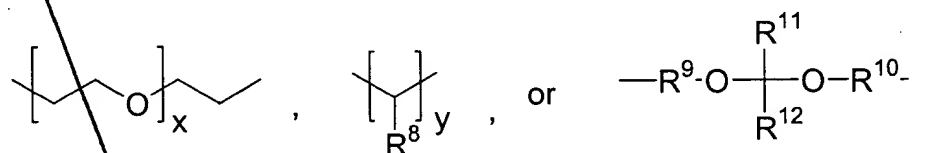
t is an integer of 2 to 200; and

R^7 is hydrogen or C_{1-4} alkyl;

R^2 is:



5 R^3 is:



where:

x is an integer of 0 to 30;

y is an integer of 2 to 200;

10 R^8 is hydrogen or C_{1-4} alkyl;

R^9 and R^{10} are independently C_{1-12} alkylene;

R^{11} is hydrogen or C_{1-6} alkyl and R^{12} is C_{1-6} alkyl; or R^{11} and R^{12} together are C_{3-10} alkylene; and

R^4 is a diol containing at least one functional group independently selected from amide, imide, urea, and urethane groups;

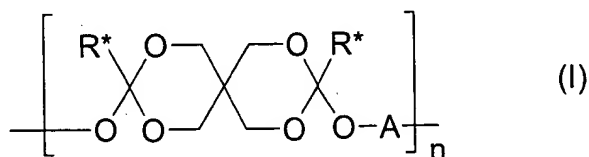
15 in which at least 0.1 mol% of the A units are R^1 , and at least 0.1 mol% of the A units are R^4 .

2. The polyorthoester of Claim 1 where n is about 5 to about 1000.

3. The polyorthoester of Claim 2 where n is about 20 to about 500.

4. The polyorthoester of Claim 3 where n is about 30 to about 300.

5. The polyorthoester of Claim 1 which comprises about 1 to about 50 mole percent of units in which A is $-O-R^1-$.
6. The polyorthoester of Claim 5 which comprises about 2 to about 30 mole percent of units in which A is $-O-R^1-$.
7. The polyorthoester of Claim 6 which comprises about 5 to about 30 mole percent of units in which A is $-O-R^1-$.
8. The polyorthoester of Claim 7 which comprises about 10 to about 30 mole percent of units in which A is $-O-R^1-$.
9. The polyorthoester of Claim 1 where p is 1 to 6.
10. The polyorthoester of Claim 9 where p is 1 to 4.
11. The polyorthoester of Claim 10 where p is 1 to 2.
12. The polyorthoester of Claim 1 where R^4 is hydrogen or methyl.
13. The polyorthoester of Claim 1 which comprises up to about 20 mole percent of units in which A is $-O-R^2-$.
14. The polyorthoester of Claim 1 which comprises about 60 to about 99.9 mole percent of units in which A is $-O-R^2-$.
15. The polyorthoester of Claim 1 where q is 1 to 6.
16. The polyorthoester of Claim 15 where q is 1 to 3.
17. A process of preparing a polyorthoester of formula I:



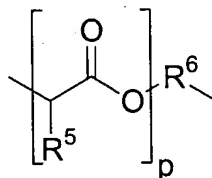
where:

R* is a C₁₋₄ alkyl;

n is an integer of at least 5; and

5 A is R¹, R², R³, or R⁴, where

R¹ is:

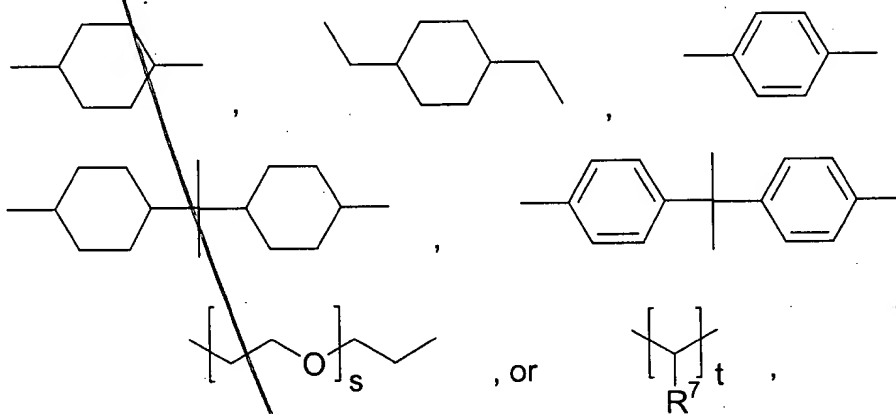


where:

p is an integer of 1 to 20;

10 R⁵ is hydrogen or C₁₋₄ alkyl; and

R⁶ is:



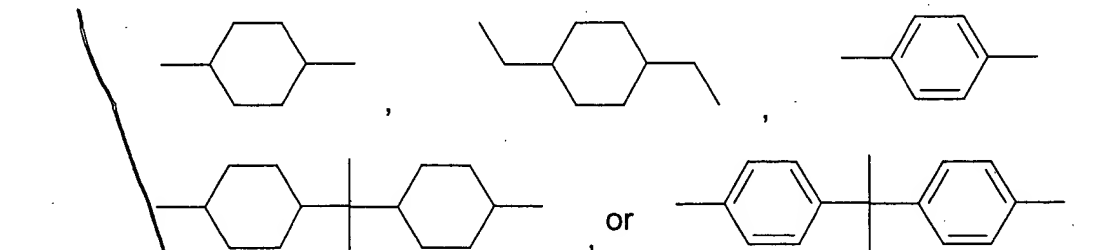
where:

s is an integer of 0 to 30;

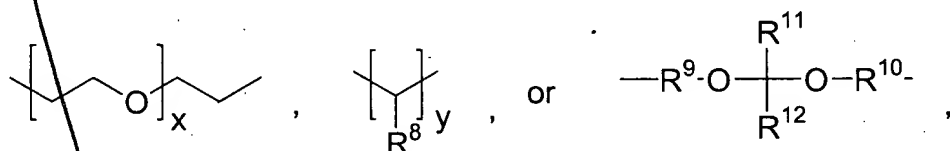
15 t is an integer of 2 to 200; and

R⁷ is hydrogen or C₁₋₄ alkyl;

R² is:

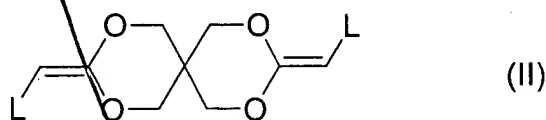


R³ is:



where:

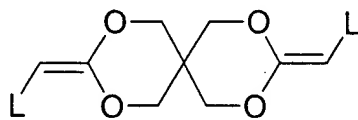
- 5 x is an integer of 0 to 30;
 - y is an integer of 2 to 200;
 - R⁸ is hydrogen or C₁₋₄ alkyl;
 - R⁹ and R¹⁰ are independently C₁₋₁₂ alkylene;
 - R¹¹ is hydrogen or C₁₋₆ alkyl and R¹² is C₁₋₆ alkyl; or R¹¹ and R¹² together are C₃₋₁₀ alkylene; and
 - 10 R⁴ is a diol containing at least one functional group independently selected from amide, imide, urea, and urethane groups;
- in which at least 0.1 mol% of the A units are R¹, and at least 0.1 mol% of the A units are R⁴,
the process comprising reacting a diketene acetal of formula II:



- 15 where L is hydrogen or a C₁₋₃ alkyl,
- with a diol of the formula HO-R¹-OH and a diol of the formula HO-R⁴-OH, and optionally at least one diol of the formulae HO-R²-OH and HO-R³-OH.

18. A polyorthoester that is the product of a reaction between:

- 20 (a) a diketene acetal of formula II;

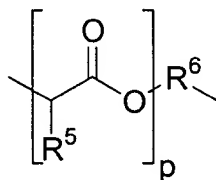


(II)

where L is hydrogen or a C₁₋₃ alkyl, and

(b) a polyol or mixture of polyols in which at least 0.1 mole percent of the total polyol content is a diol of the formula HO-R¹-OH, where

5 R¹ is:

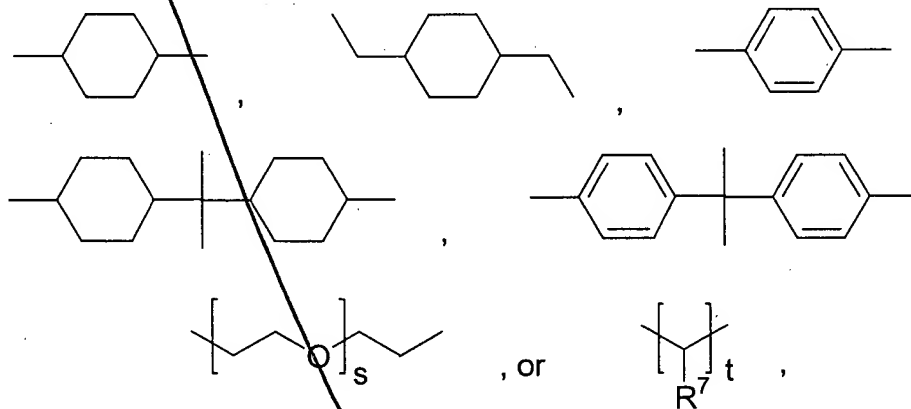


where:

p is an integer of 1 to 20;

R⁵ is hydrogen or C₁₋₄ alkyl; and

10 R⁶ is:



where:

s is an integer of 0 to 30;

t is an integer of 2 to 200; and

15 R⁷ is hydrogen or C₁₋₄ alkyl;

R¹¹ is hydrogen or C₁₋₆ alkyl and R¹² is C₁₋₆ alkyl; or R¹¹ and R¹² together are C₃₋₁₀ alkylene; and

at least 0.1 mole percent of the total polyol content is a diol of the formula $\text{HO-R}^4\text{-OH}$, where R^4 is the residue of a diol containing at least one functional group independently selected from amide, imide, urea, and urethane groups.

5 19. The polyorthoester of Claim 18 where at least one of the polyols is a polyol having more than two hydroxy functional groups.

20. A device for orthopedic restoration or tissue regeneration comprising a polyorthoester of Claim 1.

21. A bioerodible implant comprising a polyorthoester of Claim 1.

10 22. A pharmaceutical composition comprising:

- (a) an active agent; and
- (b) as a vehicle, the polyorthoester of Claim 1.

15 23. The pharmaceutical composition of Claim 22 where the fraction of the active agent is from 1% to 60% by weight of the composition.

24. The pharmaceutical composition of Claim 23 where the fraction of the active agent is from 5% to 30% by weight of the composition.

20 25. The pharmaceutical composition of Claim 22 where the active agent is selected from anti-infectives, antiseptics, steroids, therapeutic polypeptides, anti-inflammatory agents, cancer chemotherapeutic agents, narcotics, local anesthetics, antiangiogenic agents, vaccines, antigens, DNA, and antisense oligonucleotides.

25 26. The pharmaceutical composition of Claim 22 where the active agent is a therapeutic polypeptide.

27. The pharmaceutical composition of Claim 22 where the active agent is a local anesthetic.
28. The pharmaceutical composition of Claim 27 further comprising a glucocorticosteroid.
- 5 27. The pharmaceutical composition of Claim 22 where the active agent is an antiangiogenic agent.
30. The pharmaceutical composition of Claim 22 where the active agent is a cancer chemotherapeutic agent.
- 10 31. The pharmaceutical composition of Claim 22 where the active agent is an antibiotic.
32. The pharmaceutical composition of Claim 22 where the active agent is an anti-inflammatory agent.
- 15 33. A method of treating a disease state treatable by controlled release local administration of an active agent, comprising locally administering a therapeutically effective amount of the active agent in the form of a pharmaceutical composition of Claim 22.
- 20 34. The method of Claim 33 where the active agent is selected from anti-infectives, antiseptics, steroids, therapeutic polypeptides, anti-inflammatory agents, cancer chemotherapeutic agents, narcotics, local anesthetics, antiangiogenic agents, vaccines, antigens, DNA, and antisense oligonucleotides.
- 25 35. A method of preventing or relieving local pain at a site in a mammal, comprising administering to the site a therapeutically effective amount of a local anesthetic in the form of a pharmaceutically acceptable composition of Claim 22.